40. The catheter of Claim 38 wherein the dielectric film comprises a polyester film.

41. The catheter of Claim 38 wherein the dielectric film comprises a film having a thickness less than 7 microns.

42. The catheter of Claim 38 further comprising a non-conductive braid connected with the shaft.

43. The catheter of Claim 38 wherein the dielectric film surrounds an entire circumference and at least portions of both ends of the ultrasound transducer.

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44. The catheter of Claim 15 wherein the dielectric surrounds at least a portion of a circumference and one end of the ultrasound transducer.

45. The catheter of Claim 24 wherein the dielectric surrounds at least a portion of a circumference and one end of the ultrasound transducer.

46. The catheter of Claim 15 wherein the lens or window comprises a window.

47. The catheter of Claim 15 wherein the lens or window comprises a lens having a focus.--

REMARKS

In the Office Action, the Examiner rejected claims 29-30 and 32 pursuant to 35 U.S.C. § 102(b) as being anticipated by Sarangapani (U.S. Patent No. 5,328,954). Claims 1-9, 11-13 and 33-35 were rejected pursuant to 35 U.S.C. § 103(a) as being unpatentable over Crowley et al. (U.S. Patent No. 4,951,677) in view of Sarangapani. Claims 15-22 and 24-27 were rejected pursuant to 35 U.S.C. § 103(a) as being unpatentable over Crowley et al. in view of Eberle et al. (U.S. Patent No. 5,857,974). Claim 31 was rejected pursuant to 35 U.S.C. § 103(a) as being unpatentable over Sarangapani in view of Mortier et al. (U.S. Patent No. 5,899,892). Claims 36 and 37 were rejected pursuant to 35 U.S.C. § 103(a) as being unpatentable over Crowley et al. in view of Mortier et al. Claims 9 and 14 were rejected pursuant to 35 U.S.C. § 103(a) as being unpatentable over Crowley et al. in view of Sarangapani, in further view of Eberle et al. Claims 23 and 28 were rejected pursuant to 35 U.S.C. § 103(a) as being unpatentable over Crowley et al. in view of Eberle et al., in further view of Sarangapani.

Claims 29-30, 32 (Sarangapani), 31 (Sarangapani and Mortier) and 33-35 (Crowley and Sarangapani):

Independent claim 29 was rejected as being anticipated by Saranagapani. Dependent claims 30-35 were rejected as being obvious in view of various combinations of Sarangapani, Crowley and Mortier. Applicant respectfully requests reconsideration of the rejections for these claims for the reasons discussed below.

Independent claim 29 has been amended to include an electrical conductor within the shaft, as in similar but not identical dependent claim 34. Saranagapani discloses various catheters constructed of a coating that is resistant to urease and deposits (col. 1, lines 10-15). Saranagapani does not disclose catheters with an electrical conductor.

Regarding claim 29 and the combination of Crowley et al. and Sarangapani, a person of ordinary skill in the art would not combine these two references in a way providing all of the limitations of claim 29. The Examiner noted a braid 36 disclosed by Crowley et al. that would be replaced by the non-conductive braid taught by Sarangapani. However, the braid 36 of Crowley et al. comprises a braided shield of a coaxial cable (col. 6, lines 47-56). The shield is part of an electrical connection or conductor (col. 6, lines 50-53; col. 7, line 66-col. 8, line 2; and col. 9, lines 64-68). A person of ordinary skill in the art would not replace a braid used for conducting electrical signals with a non-conductive braid.

The claims 30-35 depending from independent claim 29 are allowable for the reasons stated above for independent claim 29. Furthermore, limitations of these dependent claims further distinguish the claims.

Claim 30 requires a braid of mono-filament material. Sarangapani discloses using Nylon fibers for a nylon weave to form the Nylon braid (col. 6, lines 64-66 and col. 7, lines 5-10 and 19-21). Sarangapani suggests using a plurality of fibers. There is no suggestion to use a mono-filament to form the braid.

Claim 31 requires mono-filament liquid crystal polymer material. As discussed above, Sarangapani does not disclose mono-filament material. Mortier et al. discloses using a braid layer formed of fibers (col. 3, lines 63-65). The braid layer is formed of a number of different fibers where each fiber comprises a plurality of filaments (col. 4, lines 20-22). In one embodiment, five filaments are used for each fiber (col. 4, lines 22-30). Mortier et al.

encourage the use of multiple fibers (col. 12, lines 27-33). Mortier et al. do not suggest using a mono-filament material.

Claim 33 requires that the braid is embedded within the shaft. The coaxial shield braid of Crowley et al. is embedded within the coaxial cable. The cable is rotatably placed within the shaft. The braid is not embedded within the shaft.

Claims 1-9 (Crowley, Sarangapani and Eberle) and 36 (Crowley and Mortier):

Claims 1-9, including independent claim 1, were rejected as being unpatentable over Crowley et al. in view of Saranagapani. Claim 9 was also rejected over a combination of Crowley et al., Sarangapani and Eberle et al. Dependent claim 36 was rejected over a combination of Crowley et al. and Mortier et al. Applicant respectfully requests reconsideration of the rejections for these claims for the reasons discussed below.

Independent claim 1 includes a conductor surrounded by a shaft and a non-conductive braid connected with the shaft. As discussed above, a person of ordinary skill in the art would not combine Crowley et al. and Saranagapani in the way suggested by the Examiner. The Examiner noted a braid 36 disclosed by Crowley et al. that would be replaced by the non-conductive braid taught by Sarangapani. However, the braid 36 of Crowley et al. comprises an electrical conductor for transmitting signals. A person of ordinary skill in the art would not replace a braid used for conducting electrical signals with the non-conductive Nylon braid of Saranagapani.

The dependent claims 2-9 and 36 are allowable for the reasons stated above for independent claim 1. Furthermore, limitations of these dependent claims further distinguish the claims.

Claims 2 and 3 require a braid of mono-filament material. As discussed above for claim 30, Sarangapani suggests using a plurality of fibers. There is no suggestion to use a mono-filament to form the braid.

Like claim 33 above, claim 5 requires that the braid is embedded within the shaft. The coaxial shield braid of Crowley et al. is embedded within the coaxial cable. The cable is rotatably placed within the shaft. The braid is not embedded within the shaft.

There is no suggestion in either Crowley et al. or Sarangapani that a non-conductive braid be spiral wound or a diamond weave as claimed in claim 8.

Neither Crowley et al. or Sarangapani suggests a dielectric film adjacent to an emitting surface of a transducer as claimed in claim 9. In another rejection, the Examiner combined further included Eberle et al. However, a person of ordinary skill in the art would not have combined the teachings of Eberle et al. with Crowley et al. as suggested by the Examiner. These two references teach alternative transducer array techniques. Crowley et al. use a rotatable ultrasonic transducer (col. 5, lines 54-56; col. 6, lines 66-68). A center shaft and wires also rotate (col. 7, lines 45-47). The transducer is rotated at speeds of 1,800 rpm during operation (col. 7, lines 63-66). Conversely, Eberle et al. disclose forming the transducer elements, such as an array of 64 elements, and associated signal lines on a Mylar flex circuit for ease of manufacture and assembly (col. 4, line 63-col. 5, line 22). The flex circuit with the transducer elements is shaped into a cylinder as a radial array or linear array (col. 5, lies 56-66 and col. 6, lines 27-32). As a result, the flex circuit encompasses the ultrasound transducer, occupies a relatively outer circumference of the transducer portion, and protects the transducer assembly (col. 7, lines 18-19; col. 8, lines 46-49 and col. 9, lines 15-19). The construction of Eberle et al. using the flex circuit around an array of elements does not allow for rotation of the transducer element as used in Crowley et al. The array of elements would not hold a proper relative position if supported by a flex circuit and rotated. Furthermore, rotation of a radial array adds beamformation complications avoided by having a stationary radial array. A person of ordinary skill in the art would not combine the shaft and rotating conductor of Crowley et al. with the transducer and Myler flex circuit of Eberle et al. to provide the invention of claim 9.

Claims 10-13 (Crowley and Sarangapani), 14 (Crowley, Sarangapani and Eberle), and 37 (Crowely and Mortier):

Claims 11-13 were rejected as being unpatentable over Crowley et al. in view of Saranagapani. A rejection of claim 10 was not detailed by the Examiner, but Applicants believe the Examiner meant for claims 10-13 to be rejected by Crowley and Sarangapani and claim 9 to be only rejected by Crowley, Sarangapani and Eberle. Thus, independent claim 10 will be discussed with respect to the Crowley and Sarangapani combination. Applicant respectfully requests reconsideration of the rejections for these claims for the reasons discussed below.

Independent claim 10 includes an electrical conductor surrounded by a shaft and a non-conductive insert connected with the shaft. As discussed above, a person of ordinary skill in the art would not combine Crowley et al. and Saranagapani in the way suggested by the Examiner.

The Examiner noted a braid 36 disclosed by Crowley et al. that would be replaced by the non-conductive braid taught by Sarangapani. However, the braid 36 of Crowley et al. comprises an electrical conductor for transmitting signals. A person of ordinary skill in the art would not replace a braid used for conducting electrical signals with the non-conductive Nylon braid of Saranagapani.

The dependent claims 11-14 and 37 are allowable for the reasons stated above for independent claim 10. Furthermore, limitations of these dependent claims further distinguish the claims.

Claim 11 requires a braid of mono-filament material. As discussed above for claim 30, Sarangapani suggests using a plurality of fibers.

Like claim 33 above, claim 12 requires that the braid is embedded within the shaft. The coaxial shield braid of Crowley et al. is embedded within the coaxial cable. The cable is rotatably placed within the shaft. The braid is not embedded within the shaft.

Like claim 9 discussed above, claim 14 additionally requires a dielectric film adjacent an emitting surface of a transducer. A person of ordinary skill in the art would not have combined the teachings of Eberle et al. with Crowley et al. as suggested by the Examiner. These two references teach alternative transducer array techniques – (1) a rotatable transducer (e.g. a single element) and (2) a stationary array of elements mounted to a flex circuit. The construction of Eberle et al. using the flex circuit around an array of elements does not allow for rotation of the transducer element as used in Crowley et al. A person of ordinary skill in the art would not combine the shaft and rotating conductor of Crowley et al. with the transducer and Myler flex circuit of Eberle et al. to provide the invention of claim 14.

Claims 15-22 and 24-27 (Crowley and Eberle) and 23 and 28 (Crowley, Eberle and Sarangapani):

Claims 15-22 and 24-27, including independent claims 15 and 24, were rejected as being unpatentable over Crowley et al. in view of Eberle et al. Dependent claims 23 and 28 were rejected over the combination of Crowley et al. and Eberle et al. in further view of Sarangapani. Applicant respectfully requests reconsideration of the rejections for these claims for the reasons discussed below.

Like claim 9 discussed above, independent claims 15 and 24 require a dielectric film adjacent a transducer or between a shaft and transducer. A person of ordinary skill in the art would not have combined the teachings of Eberle et al. with Crowley et al. as suggested by the Examiner. These two references teach alternative transducer array techniques – (1) a rotatable transducer (e.g. signal element) and (2) a stationary array of elements mounted to a flex circuit. The construction of Eberle et al. using the flex circuit around an array of elements does not allow for rotation of the transducer element as used in Crowley et al. The elements would not hold a proper relative position if supported by a flex circuit and rotated. A person of ordinary skill in the art would not combine the shaft and rotating conductor of Crowley et al. with the transducer and Myler flex circuit of Eberle et al. to provide the invention of claims 15 and 24.

The dependent claims 16-23 and 25-28 are allowable for the reasons stated above for independent claims 15 and 24. Furthermore, limitations of these dependent claims further distinguish the claims.

Claims 16 and 25 require positioning of the dielectric film between a lens and the transducer. There is no suggestion in Eberle et al. to use a lens with the Mylar and Crowley et al. do not suggest positioning of matched material or dielectric between a transducer and lens.

Claims 23 and 28 require a non-conductive braid connected with the shaft. As discussed above, a person of ordinary skill in the art would not combine Crowley et al. and Saranagapani in the way suggested by the Examiner. The Examiner noted a braid 36 disclosed by Crowley et al. that would be replaced by the non-conductive braid taught by Sarangapani. However, the braid 36 of Crowley et al. comprises an electrical conductor for transmitting signals. A person of ordinary skill in the art would not replace a braid used for conducting electrical signals with the non-conductive Nylon braid of Saranagapani.

New Claims 38-43:

New claims 38-43 were added to claim further subject matter disclosed in the above captioned application. The Mylar or Kapton flex circuit of Eberle et al. is used for ease of manufacturing and assembly, not as a dielectric. For example, the flex circuit does not surround the transducer or cover the ends of the radial array (see Figure 5). By not surrounding the transducer, dielectric protection is lessened.

Conclusion:

Applicants respectfully submit that all of the pending claims are in condition for allowance and seeks early allowance thereof. If for any reason, the Examiner is unable to allow the application but believes that an interview would be helpful to resolve any issues, he is respectfully requested to call the undersigned at (312) 321-4726.

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